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09/411,143	10/04/1999	THOMAS C.K. YUEN	SRSLABS.257A	7907

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EXAMINER	
JACOBSON, TONY M	

ART UNIT	PAPER NUMBER
2644	6

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/411,143	YUEN ET AL.	
	Examiner	Art Unit	
	Tony M Jacobson	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 October 1999*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☒ Claim(s) *21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 October 1999* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4 and 5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to because of the deficiencies noted on the attached Notice of Draftsperson's Patent Drawing Review, form PTO 948. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: Numerous minor inconsistencies are noted in the specification, for example:

at page 24, lines 21-23, the description is inconsistent with Fig. 6C;

at page 24, line 28, "622" appears to be a typographical error for –122--;

at page 25, line 6, "162" ... –622--;

at page 25, line 14, "522" ... –122--;

at page 25, line 26, "equations 1 and 2 above" are referred to, but appear to be absent;

at page 26, line 29, "120kHz" appears to be a typographical error for –20kHz--;

at page 35, line 6, a "fifth bandpass filter 1414" is referred to in Fig. 14, but not shown;

at page 35, line 19, "throw" appears to be a typographical error for –pole--;

page 35, line 27 refers to "switch 1419", absent from Fig. 14;

page 36, lines 25 and 26 refer to switch 1505, not illustrated;

at page 36, line 27, "40";

at page 36, line 31, "40, 60, and 100 Hz";

at page 37, lines 2-3, "60, 100, and 150 Hz";

at page 37, lines 7-8 and 11, "40, 60, 100, and 150 Hz";

page 37, lines 24-28 indicates that the gain is increased in response to either an increase or a decrease in the detected envelope amplitude;

at page 38, lines 17 et seq., elements 1742 and 1746-1750 are referred to in Fig. 16, but not shown;

at page 40, line 25, "1418" and "1420";

at page 41, lines 21 et seq., "1914", "1916", and "1917";

at page 44, line 31, "output buffers 2006";

at page 45, lines 13 and 17, "non-inverting";

pat age 44, line 19, "2108";

at page 46, lines 9 et seq., "2125 Hz", "21.8kHz";

at page 46, lines 27-28, "120kHz";

at page 52, line 10, "FET 2814";

at page 52, line 11, "pin P10".

Appropriate correction is required.

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the

specification.

4. The attempt to incorporate subject matter into this application by reference to non-patent publications by Shaw and by Mehrgardt et al. at lines 1-7 of page 48 of the specification is improper because these are non-patent publications (see MPEP 608.01(p)).

Claim Objections

5. Claim 21 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 21 recites "The method of Claim 21, wherein..." and thus attempts to depend upon itself. It is assumed in the following that applicant intended to recite "The method of Claim 20, wherein...", since claim 20 is the only preceding claim reciting a method.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 5, 14, 15, and 21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject

matter which applicant regards as the invention.

8. Claim 5 recites the limitation "said third fourth" in line 9 of page 74. There is insufficient antecedent basis for this limitation in the claim. It is assumed in the following that Applicant intended to recite "said fourth filter".

9. Claims 14 and 15 recite the limitation "said variable gain module" in line 1 of claim 14 and "said variable gain circuit" in line 1 of claim 15. There is insufficient antecedent basis for these limitations in the claims. It appears that Applicant intended to refer to claim 13 (the only preceding claim reciting such a limitation) instead of claim 10 in both of these claims, and to recite "variable gain module" in claim 15. The following prior-art rejections of claims 14 and 15 are based on these assumptions.

10. Claim 21 recites "The method of Claim 21, wherein..." and thus attempts to depend upon itself, and therefor it is unclear what is being claimed. It is assumed in the following that applicant intended to recite "The method of Claim 20, wherein...", since claim 20 is the only preceding claim reciting a method.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 1-4 and 6-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamatsu (US 5,999,630) in view of Short et al. (US 4,739,514).

13. Regarding claims 1, 6, and 20, Iwamatsu discloses in Fig. 5, a sound enhancement (audio correction) system (18) comprising: a sound enhancement module (38) configured to correct a perceived height of an apparent sound stage produced by a plurality of loudspeakers (column 5, line 34 –column 6, line 11); and a sound enhancement module (64) configured to correct a perceived width of the apparent sound stage (column 1, lines 5-54). Iwamatsu does not disclose a sound enhancement module configured to correct a perceived bass response of the loudspeakers. Short et al. discloses in Figs. 1 and 3 sound enhancement modules for correcting a bass response (and thus a perceived bass response) of a one or more loudspeakers (column 2, line 43 –column 3, line 49). It was well known in the audio signal processing art at the time the present invention was made to combine various known audio enhancement techniques and systems of the prior art in order to simultaneously enhance or improve multiple aspects of the sound produced. It would have been obvious to one of ordinary skill in the art at the time the present invention was made to combine the bass enhancement module of Short et al. with the system of Iwamatsu in order to provide a further enhanced acoustic output signal. The system so modified performs the method of claim 20 in normal use.

14. Regarding claims 2-4, absent any teaching to the contrary, it would have been obvious to one of ordinary skill in the art at the time the present invention was made to arrange the modules in the system of Iwamatsu, modified according to the teachings of Short et al. as described above regarding claim 1, in any convenient or logical manner, placing the vertical image correction module either before or after the bass enhancement module as an obvious design choice.

15. Regarding claims 7 and 21, although Applicant's disclosure has not clearly defined a difference between a perceived height of an apparent soundstage and a perceived vertical location of an apparent soundstage, and "height", as recited in claim 6, can generally mean either vertical location or vertical size, by focusing the apparent vertical location of a sound image (stage) to a certain location as described at column 5, line 34 –column 6, line 11, the system of Iwamatsu inherently corrects a perceived vertical size ("height") and a perceived vertical location of an apparent sound stage produced by the plurality of loudspeakers.

16. Regarding claims 8 and 22, Iwamatsu discloses in Fig. 5 that the height correction (first) module comprises a left-channel filter (38-upper) to filter sounds in a left signal channel (SL) and a right-channel filter (38-lower) configured to filter sounds in a right signal channel (SR).

17. Regarding claims 9 and 23, Iwamatsu discloses at column 6, lines 5-12 that the left- and right-channel filters (38) are configured to filter (adjust frequency components of) the left and right channels in accordance with a variation in frequency response of a human auditory system as a function of vertical position of a sound source.

18. Regarding claims 10 and 24, Fig. 7B shows that the left- and right-channel filters (38) in the system of Iwamatsu are configured to emphasize lower frequencies (those lower than frequency "Nt") relative to higher frequencies (those proximate to frequency "Nt"), as broadly as claimed.

19. Regarding claims 11 and 25, in the sound enhancement system of Iwamatsu, modified according to the teachings of Short et al., the perceived bass correction ("second") module is configured to emphasize portions of lower frequencies relative to higher frequencies, as taught by Short et al. at column 1, lines 20-56 and column 4, lines 32-43.

20. Regarding claims 12 and 26, in the sound enhancement system of Iwamatsu, modified according to the teachings of Fig. 3 of Short et al., the second sound enhancement module (Fig. 3 of Short et al.) is configured to receive a plurality (two) of input signals (11L and 11R) and to emphasize common-mode portions of lower frequencies of the input signals relative to higher frequencies of said input signals

(inherently, due to summer 17 and low-frequency bandpass filter 16).

21. Regarding claims 13 and 27, the sound enhancement module of Fig. 3 of Short et al. comprises a first combiner (17) configured to combine a[t] least a portion of a left channel signal with at least a portion of a right channel signal to produce a combined signal; a filter (18) configured to select a portion of said combined signal to produce a filtered signal; a variable gain module (15) configured to adjust (amplify) said filtered signal in response to an envelope of said filtered signal (the inherent mode of operation of a compressor) to produce a bass enhancement signal; a second combiner (14L) configured to combine at least a portion of said bass enhancement signal with said left channel signal; and a third combiner (14R) configured to combine at least a portion of said bass enhancement signal with said right channel signal.

22. Regarding claims 14, 15, 28, and 29, Short et al. disclose generally that the variable gain module comprises a compressor (which compresses the filtered signal during an attack time period); and at column 3, lines 50-52 that the compression ratio might be set to any other value besides the 2:1 ratio of the preferred embodiment in order to realize certain desired equalization curves. It would have been obvious to one of ordinary skill in the art to set the compression ratio to any other value, including values less than 1:1, such as 1:2, which corresponds to expansion (in which the filtered signal would be expanded during a decay time period), in order to provide a further

enhanced bass output from the system.

23. Regarding claims 16, 17, 30, and 31, the perceived width correction ("third") module 64 in the system of Iwamatsu inherently receives input signals comprising a left-channel input and a right-channel input, identifies a common-mode portion, provides a common-mode behavior in response to common-mode portions of the input signals, identifies a differential-mode portion, and provides a differential-mode behavior in response to differential-mode portions of the input signals; and these respective behaviors are inherently due to providing a common-mode transfer function and a differential-mode transfer function.

24. Regarding claims 18, 19, 32, and 33, although Iwamatsu does not directly disclose the differential-mode transfer function frequency characteristic of the perceived width correction module (64) in the system, analysis of the block diagram shown in Fig. 10, as described at column 7, line 65 –column 8, line 53, indicates that for very low frequency differential-mode (equal and opposite) input signals the signal level at either output will be slightly greater than the level of the corresponding input signal since the 1.2-ms delayed signal (column 8, lines 40-45) fed back within a given channel will be substantially in phase with the input signal and the crosstalk canceling signal from the opposite channel will also be substantially in phase, since it is initially of opposite phase, delayed slightly to remain of substantially opposite phase, then inverted at element 84 or 88. As the frequency of the differential-mode input signal is increased, a point will be

reached (833 Hz) where the delayed signals become of opposite phase with the input signal and the output signal will be at a local minimum level. As the differential-mode input signal frequency is further increased, the delayed signals will again become in phase with the input signal and the output will reach a local maximum (at 1.67 kHz). Additional peaks and dips will occur in the differential-mode transfer function frequency characteristic as the input frequency is further increased, with peaks occurring at each even multiple of 833 Hz and dips occurring at each odd multiple of 833 Hz. Thus, the differential-mode transfer function emphasizes lower frequencies (those far below 833 Hz) relative to higher frequencies (those around 833 Hz) and the differential-mode transfer function is configured to provide a first de-emphasis for frequency components in a first frequency band (around 833 Hz), provide a second de-emphasis for frequency components in a second frequency band (around 1.67 kHz), provide a third de-emphasis for frequency components in a third frequency band (around 2.50 kHz), and provide a fourth de-emphasis for frequency components in a fourth frequency band (such as 3.33 kHz), said first frequency band lower than said second frequency band, said second frequency band lower than said third frequency band, and said third frequency band lower than said fourth frequency band, said second de-emphasis value and fourth de-emphasis value less than said first de-emphasis value and said third de-emphasis value.

25. Regarding claims 34-36, the system of Iwamatsu, modified according to the teachings of Short et al. as described above regarding claims 1 and 6, can be

alternatively described according to the limitations recited in these claims without further modification; therefore, the claims are unpatentable by the same reasoning.

26. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lendaro et al. (US 5,208,493) in view of Petroff (US 5,400,405).

27. Regarding claim 5, Lendaro et al. discloses in Fig. 2, a prior art stereo audio image enhancement system comprising at least two audio signals (L and R), said audio signals having common-mode information which is common to said audio signals and differential information which is not common to said audio signals (inherent characteristics of a stereo audio signal pair); a first amplifier (11) in communication with one of said audio signals (L), said first amplifier having an inverting input (17) and a non-inverting input (13); a second amplifier (12) in communication with one of said audio signals (R), said second amplifier having an inverting input (20) and a non-inverting input (14); a "second" filter (24 in combination with 25) in communication with said inverting input (17) of said first amplifier (11) and said inverting input (20) of said second amplifier (12), said second filter configured to modify a "second" set of frequencies (inherently); a "third" filter (16 in combination with 17L) in communication with said inverting input (17) of said first amplifier (11) and an output (15) of said first amplifier, said "third" filter configured to modify a "third" set of frequencies (inherently), wherein said "second" and "third" sets of frequencies are combined to create a first enhanced output signal (V_3); and a "fourth" filter (19 in combination with 27R) in

communication with said inverting input (20) of said second amplifier (12) and an output (18) of said second amplifier, said "fourth" filter configured to modify a "fourth" set of frequencies (inherently), wherein said "second", and "fourth" sets of frequencies are combined to create a second enhanced output signal (see column 2, line4 –column 3, line 28). (The quoted terms "second", "third", and "fourth" as used in this paragraph are intended to refer to elements by name, not to indicate a count, in order to make clear the correlation to Applicants claimed elements.) Lendaro et al. does not disclose a "first" filter in communication with the non-inverting input of the first amplifier and the non-inverting input of the second amplifier, said "first" filter configured to modify a "first" set of frequencies in the differential information. As described at column 2, line 64 – column 3, line 2, the overall effect of the system (in an active mode of operation) is to enhance the differential information contained in the two input signals beginning from very little enhancement at low frequencies, increasing enhancement from about 150 Hz or 200 Hz, full enhancement from about 1 kHz to 3 kHz, then decreasing enhancement to virtually zero enhancement above 5 kHz. Petroff discloses in Fig. 1, a similar image enhancement system in which broadband differential information is enhanced due to resistors (R4 and R5) coupling between the inverting inputs of equivalent first and second amplifiers (14L and 14R). Petroff also includes a filter, formed by resistors R1, R2, R3, and capacitor C1, in communication with the non-inverting inputs of the first and second amplifiers, that provides high-frequency positive-polarity cross coupling between the two input signal channels. Petroff discloses at column 4, lines 28-38 that the high-frequency positive-polarity cross coupling acts to increase the common-mode content

(inherently decreasing the differential content) of the two channels in the high-frequency range, in effect converging to a degree the high-frequency imaging toward a central perceived point for enhanced localization. It would have been obvious to one of ordinary skill in the art at the time the present invention was made to include the high-frequency positive-polarity cross coupling filter of Petroff in the system of Lendaro et al. (which would be equivalent to the "first" filter in communication with the non-inverting input of the first amplifier and the non-inverting input of the second amplifier, said "first" filter configured to modify a "first" set of frequencies in the differential information, as recited in Applicant's claim 5) in order to further enhance the stereo image by enhancing the high-frequency localization.

Conclusion

28. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

29. Searle (US 3,970,787) discloses a system for enhancing a stereophonic signal to simulate an auditorium environment, including filtering to correct a perceived vertical and horizontal image position.

30. Jaeger et al. (US 4,177,356) discloses a signal enhancement system which splits an input signal into a plurality of frequency bands, performs automatic gain control on the individual frequency bands, then recombines the bands to form an enhanced audio

signal.

31. Nishikawa (US 4,191,852) discloses a system for widening a stereophonic sound image.

32. Myers (US 4,817,149) discloses a system for providing virtual 3-dimensional positioning of a monaural input signal to a stereo output.

33. Anderson et al. (US 4,831,652) discloses a circuit for providing switchable stereo sound field expansion.

34. Takagi et al. (US 5,018,205) discloses a system for automatically compensating a stereo audio signal to correspond to the loudness contours of human hearing, with compression in a common bass channel in one embodiment.

35. Petroff (US 5,872,851) discloses a dynamic stereo enhancement system which dynamically controls the gain applied to sum and difference signals.

36. Suzuki (JP 58146200 A) discloses a system and method for localizing a perceived elevation of a stereo audio signal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony M Jacobson whose telephone number is 703-305-5532. The examiner can normally be reached on M-F 11:00-7:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W Isen can be reached on 703-305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

tmj
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